Nanotechnology and Catalysis Research Centre

VISION

To be an internationally renowned and recognized CoE in Catalysis and Nanomaterials

MISSION

To advance technological excellence in multidisciplinary research for address the key challenges of 21st century

NANOCAT Research Centre
Annual Report 2022

EDITORIAL TEAM

Prof. Dr. Mohd Rafie Bin Johan (Director)
Dr. Marlinda Ab Rahman (Head of Editorial Team)
Lia Zaharani (Designer)

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DIRECTOR'S FOREWORD

Nanotechnology and Catalysis Research Center (NANOCAT) has been established since 2001 at Universiti Malaya as a specialized center of excellence (COE) in nanotechnology and catalysis. Our vision is to be an internationally renowned and recognized CoE in Catalysis and Nanomaterials. NANOCAT offers students, researchers and academics a wonderful place to study and research. It is highly inter disciplinary in that chemists, biologists, physicists and engineers all work together to create amazing new materials with remarkable properties and to develop devices that change the way we live. They are also encouraged to carry out their individual scientific research resulting in publications in the best journals. NANOCAT also has strong collaboration with the industrial partner such as Petronas, Hartalega, Oleon and others. We have access to the latest analytical equipment including filed emission scanning electron microscopes, x-ray diffraction, BET analysis, various spectroscopies, chemical reactors and thermal analysis methods.

Prof. Dr. Mohd Rafie Bin Johan

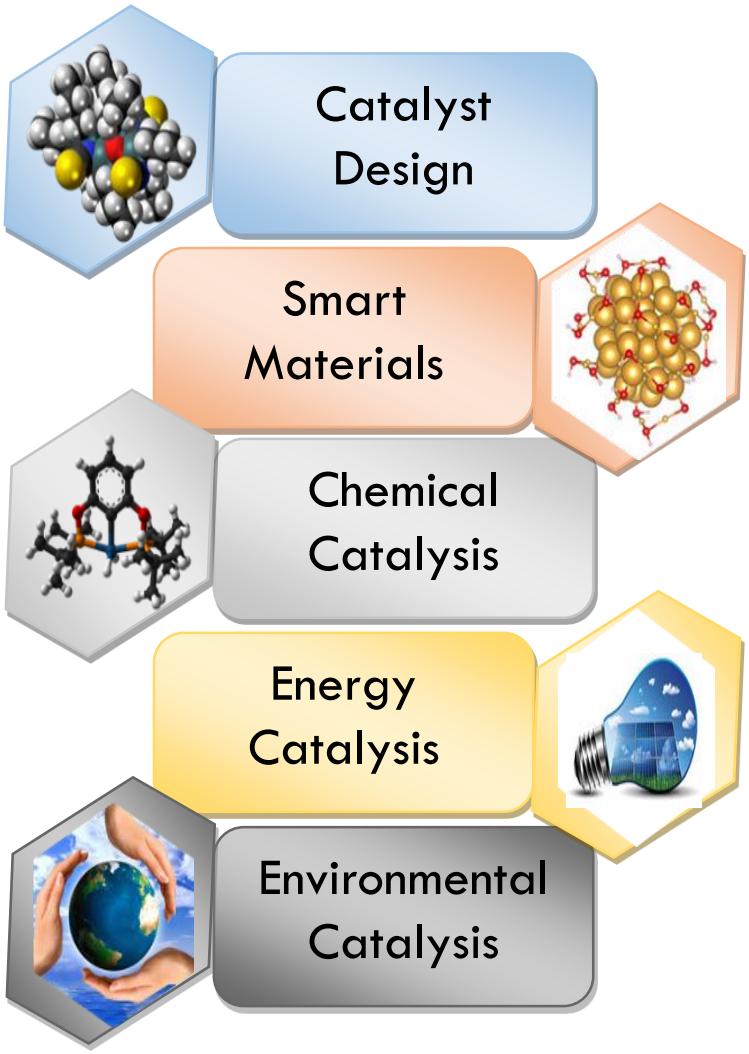
Director of Nanotechnology & Catalysis Research Centre

ABOUT NANOCAT

NANOCAT (Nanotechnology and Catalysis Research centre) is a PTj incorporated by UM in 2012, a UMCoE. Its mission is to be a world leader in "catalysis and nanotechnology" coining sustainability and green technology. NANOCAT research thrust is deploying catalysis to support energy, chemical synthesis, environment pollution and global warming mitigation as well as designing smart materials as catalyst, sensor, nanocoating, and nanocomposite.

NANOCAT was given a status of HICoE Potential in 2013, in catalysis. The Centre has strived to attain a national status for HICoE (MOHE) as well as NanoCentre (NNC, MOSTI) with strong support and commitment from Universiti Malaya. In the last 6 years, 2017 to 2022, it witnessed a pronounced explosion in its productivity in all aspects.

SCOPE OF RESEARCH



RESEARCH PROJECT

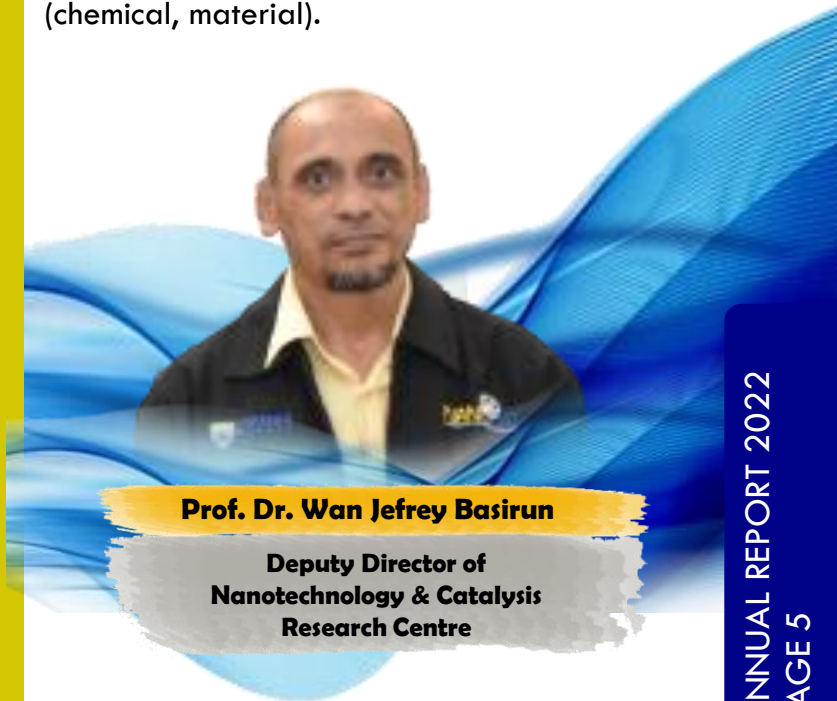
As a national research center focusing on nanotechnology and catalysis, NANOCAT has come out with a strategic planning in research grant application. With that in mind, the emphasis has been given to five niche areas of NANOCAT which are catalyst design, energy, chemical synthesis, and environmental mitigation as well as smart materials.

MANAGEMENT STAFF

Prof. Dr. Mohd Rafie Bin Johan

Director of Nanotechnology & Catalysis Research Centre

Mohd Rafie Johan was a Professor of Materials Engineering in Department of Mechanical Engineering, University of Malaya. Currently, he is Director of Nanotechnology and Catalysis Research Center (NANOCAT), University of Malaya. He gained his PhD in 2005 from Department of Physics, University of Malaya. He is the author in 376 peer-reviewed (ISI) papers with *h*-index 36. Prof. Rafie is well recognized internationally in the field of Nanotechnology. Testimony to this, he has been elected in Evaluation Panels for AET and ITR clusters and UPGP and for grants applications at UMRG, PRGS, FRGS and Qatar Foundation. He has been appointed as a panel for Yang di Pertuan Agong Scholarship and COMSTECS for Islamic Organization Country for evaluation of best scientific papers for Muslim Scientist. He also secured funding as PI from the University of Malaya and Malaysian Government. For the past two years, Prof Rafie has been appointed the editor-in-chief of The International Conference of Science and Engineering Materials (ICOSEM). Prof Rafie has been invited as a speaker to numerous talks and conferences and also Guest Editor for Symmetry (ISI journal) and editor for Asean Engineering Journal. He leads Nanomaterials Engineering Research Group of 45 PhD and 30 Master. These supervised students span over a quite broad scientific area going from science (chemistry, physics, material science, biology) to engineering (chemical, material).



Prof. Dr. Wan Jefrey Basirun

Deputy Director of Nanotechnology & Catalysis Research Centre

Wan Jefrey Basirun is currently a Professor in Electrochemistry and Physical Chemistry started his career in the department of Chemistry, University Malaya as the department undergraduate tutor in 1991 upon graduation in bachelors in Science with honors majoring in Chemistry, and proceeded with a PhD degree in electrochemistry in 1997 from the University of Southampton in United Kingdom in 1997. Since joining the active research groups in the department of Chemistry in 1997, he has supervised a total of 31 PhD and 7 Master students to completion, in addition have authored and co-authored more than 314 papers in journals indexed ISI web of knowledge, with a *h*-Index of 47. His appointment as the Deputy Director in NANOCAT in July 2018 is aimed to strengthen NANOCAT's niche research areas. His research interest is on the use of nanomaterials and nanocomposites in catalytic processes, sensors, biomaterials and energy conversion and storage.

ACADEMIC STAFF

Assoc. Prof. Dr. Ong Boon Hoong

Assoc. Prof. Ir. Ts. Dr. Lai Chin Wei

Assoc. Prof. Dr. Suresh Sagadevan

Prof. Dr. Juan Joon Ching

Assoc. Prof. Dr. Nader Ghaffari Khaligh

Dr. Chee Chin Fei

Assoc. Prof. Dr. Nurhidayatullaili Muhd Julkapli

Dr. Yasmin Abdul Wahab

Dr. Nam Hui Yin

Assoc. Prof. Dr. Lee Hwei Voon

Dr. Marlinda Ab Rahman

Dr. Nor Aliya Hamizi

Dr. Zaira Zaman Chowdhury

ADMINISTRATIVE STAFF

Muhammad Nur Iman Amir
Research Assistant

Nur'Adilah Md Jelani
Assistant Registrar (N41)

Afzalina Che Kob @Yaacob
Project Officer (N41)

Khairul Iskandar Baharom
Assistant Engineer (JA29)

TECHNICAL STAFF

Mohamad Safuan Kamaruddin
Assistant Science Officer (C29)

Noor Fariza Mohd Fawzi
Research Officer (Q41)

Fatimah Zahara Abdullah
Research Officer (Q41)

Nuramera Pa'dek
Science Officer (C41)

Durga Devi Suppiah
Research Officer (Q48)

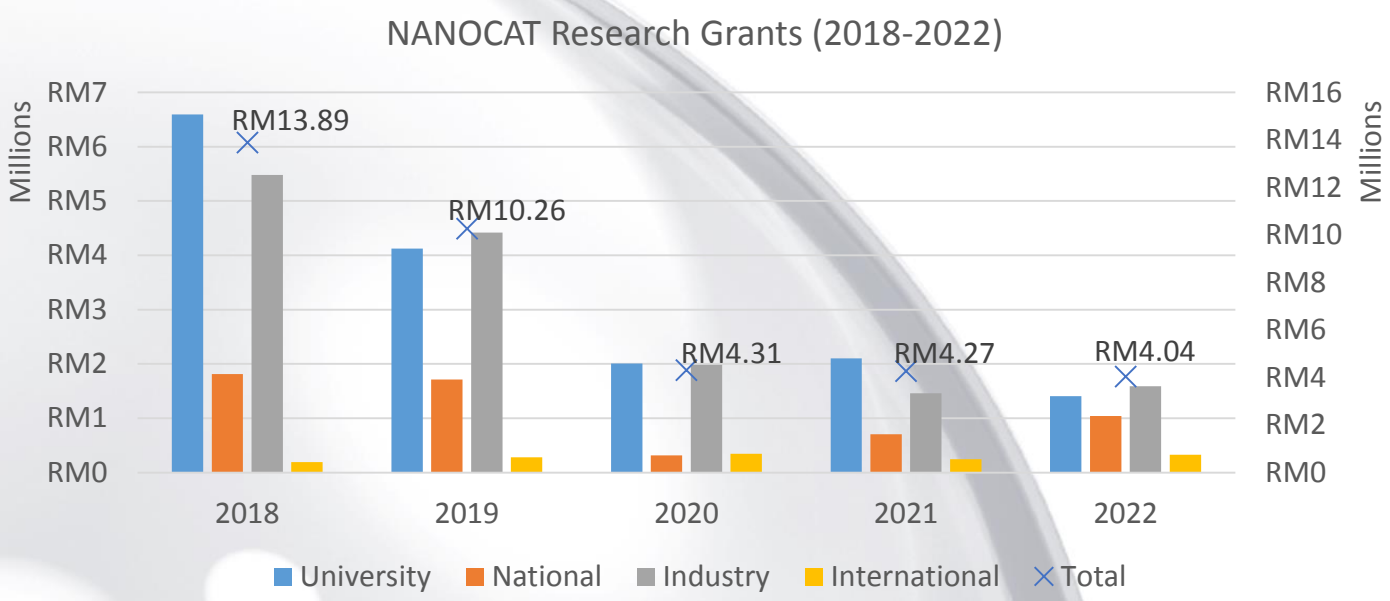
Nur Azrin Daud
Research Assistant

Norlia Abd Rani
Research Assistant

Farhana Abd Wahid
Assistant Science Officer (C29)

Dr. Lee Kian Mun
Research Officer (Q52)

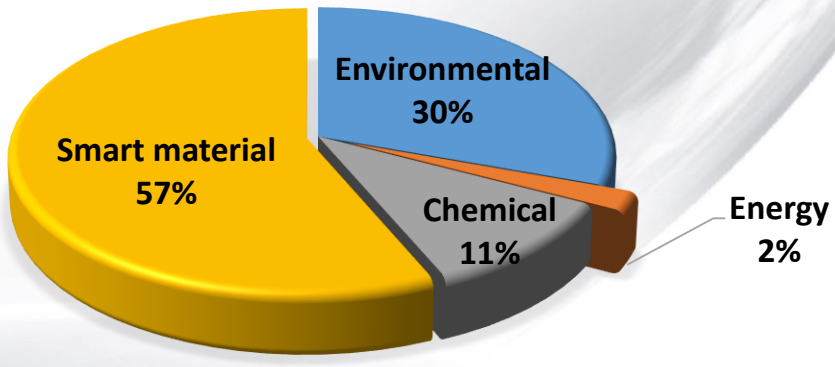
RESEARCH FUNDINGS



As a national research center focused on nanotechnology and catalysis research areas, NANOCAT has come out with a strategic planning in research grant application. With that in mind, the emphasis has been given to four niche areas of NANOCAT which are environmental, smart materials, chemical synthesis and energy that aligned with the Sustainable Development Goals (SDGs). This has been clearly translated to the active research grant 2022 secured by NANOCAT academic staff, which out of RM RM 4,361,712.57 total amount of research funding received, 57 % was contributed by the smart materials, 30 % by environmental studies, 11 % by chemical synthesis, and 2 % by energy-related studies. The focused of research grant sources selection for NANOCAT Research Center is based on the Industrial grant, UM Research Grant, National Grant, and International Grant with the amount percentage of 36 %, 32 %, 24 % and 8 %, respectively. With this amount of funding received, NANOCAT research thrust could progressively developing and serving catalysis and nanotechnology research not only in Malaysia basis but also over the international region.

Niche Areas 2022

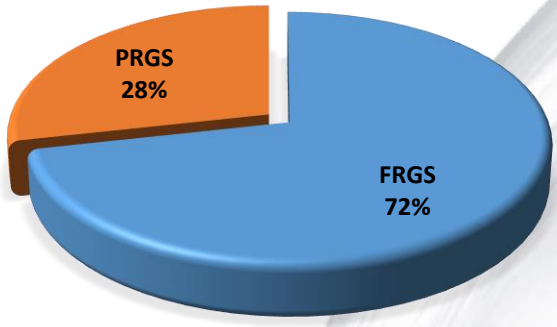
2018: Environment → Smart materials → Energy → Chemical
2019: Environment → Smart materials → Energy → Chemical
2020: Smart material → Environment → Chemical → Energy
2021: Smart material → Environment → Chemical → Energy
2022: Smart material → Environment → Chemical → Energy



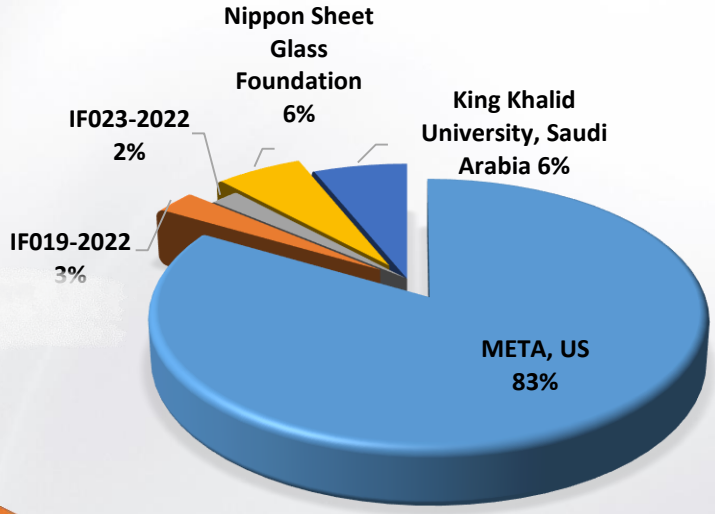
*Total of 46 active projects.
**Keywords from project titles used to determine the niche areas.

RESEARCH GRANTS

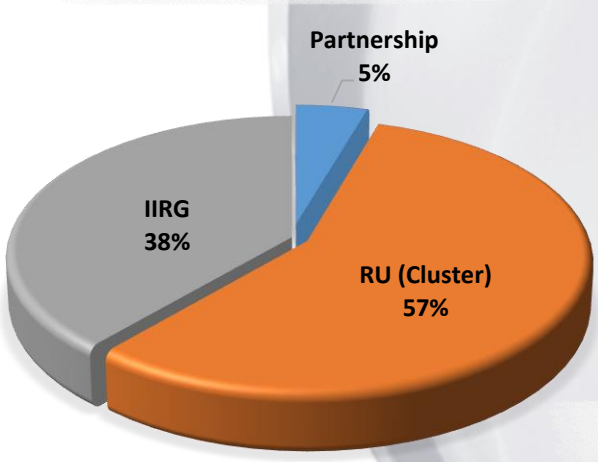
National Grants



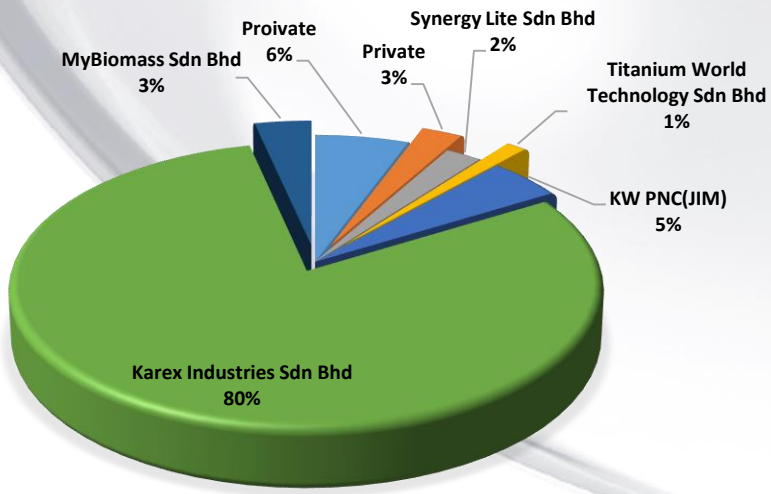
International Grants



UM Grants

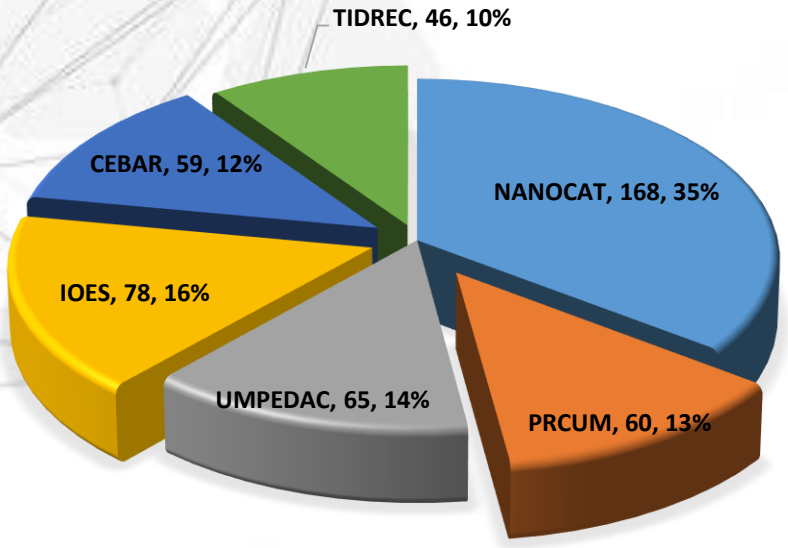


Industry Grants

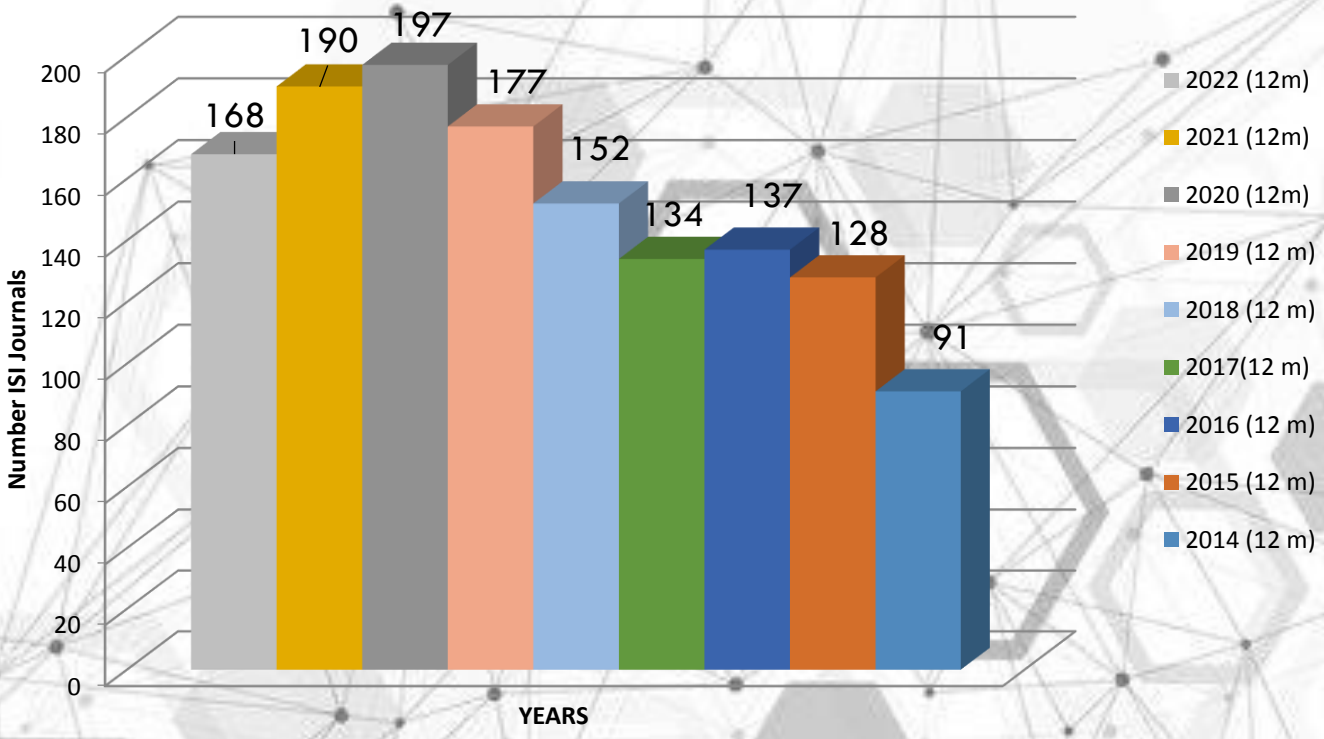


PUBLICATIONS ANALYSIS

2022 UM PAPERS INDEXED IN WOS ACCORDING TO UM CENTRE OF EXCELLENCE (6 UMCOES) - AS OF 31TH MAC 2023



ISI PAPERS_NANOCAT (UM) INDEXDED IN WOS (2014 – 2022) AS OF 31 MAC 2023



RESEARCH FACILITY

Spectroscopy Hall

The Spectroscopic Hall, a laboratory within NANOCAT, focuses on determination of physical and chemical structural properties, chemical properties, morphological and texture properties, for liquid, semisolid and solid samples.

- Scanning Electron Microscope (SEM)
- Raman Spectroscopy (RAMAN)
- Elemental Analyser (CHNOS)
- Fourier Transform Infra red (Ex situ-FTIR)
- Fourier Transform Infra red (In situFTIR)
- Differential Scanning Calorimetry (DSC)
- Differential Scanning Calorimetry (In situ-DSC)
- Zeta Potential (ZP)
- Particle Size Distribution (PSD)
- Thermogravimetry Analysis (TGA)
- Thermogravimetry Mass Spectroscopy (TG-MS)
- UV-Vis Spectroscopy (UV-VIS)
- Vibration Sample Magnometer (VSM)
- Hall Effect - Ball milling

Reactor & Combinatorial Technology Hall

Reactor Hall focuses on catalytic performance screening and testing especially for petrochemical & bio oil industries. Equipped with GC to quantitatively analyze the reaction products to study the reaction mechanism allowing a reaction selectivity and yield to be optimized.

- Karl Fischer Coulometer (KF)
- Freeze Dryer
- Autoclave 200 ml HS/SS
- Density Meter
- Selective Oxidation Fixed-bed Reactor (SELOX)
- Precipitation Reactor (Lab Max)
- Trickle Flow Reactor (TFR)
- High Performance Liquid Chromatography (HPLC)
- Gas Chromatography (TCD-FID)
- Gas Chromatography (GC-MS)
- Temperature Programmed Desorption, Reduction, and Oxidation (TPDRO)
- Surface Area Analyser (BET Single Port)
- Tensiometer (Surface Tension)
- Fixed-bed Microreactor (atmospheric pressure).
- Gel Permeation Chromatography (GPC)
- Ion Chromatography (IC)

X-Ray Hall

X-Ray Hall provide a non-destructive technique to determine phase composition of solid materials.

- X-Ray Diffraction (Ex situ-XRD)
- X-Ray Diffraction (In situ-XRD)

LABORATORY

- SPECTROSCOPY HALL
- X-RAY HALL
- REACTOR HALL
- COMBINATORIAL TECHNOLOGY HALL
- UM-HARTALEGA LABORATORY
- BIOSYNTHESIS LABORATORY
- NANOMATERIAL LABORATORY
- ADVANCED FUNCTIONAL NANOGROUP LABORATORY
- OLEON LABORATORY
- CHEMICAL CATALYST LABORATORY
- SPECIALTY CHEMICALS HALL
- ENVIRONMENTAL LABORATORY
- ENERGY AND ADDITIVES LABORATORY
- CHEMICAL STORE
- QUANTUM NANOTECHNOLOGY LABORATORY
- NANO MATERIALS ENGINEERING LABORATORY
- BIOMEDICAL SCIENCE LABORATORY
- KAREX LABORATORY
- ENERGY ANF BATTERY LABORATORY
- NANO TRANSITION METAL OXIDE PRODUCTION PLANT

NANOCAT PRODUCTS

https://nanocat.um.edu.my

Nanotechnology and Catalysis Research Center (NANOCAT), since 2012 instrumental in spearheading Research, Development & Commercialization of catalysis and nanotechnology towards sustainability and green technology for all interested parties.

Looking forward to Profitable Partnership

Prof. Dr. Mohd Rafie Johan (Director)
Phone: + 603-7967 6959; Email: mrafie|@um.edu.my

Dr. Leo Bey Fen (Product Specialist)
Phone: + 603-7967 7515; Email: beyfenleo@um.edu.my

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Email us at **ts_nanocat@um.edu.my** or contact us at **+603-7967 6273** for a quotation.
Other enquiries > PIC: **Durga Devi Suppiah** (durgadevi@um.edu.my or +60 12-332 2750)

NanoCAT™ IronAgro
> IONP for Plant Iron Supplement. Absorbable by plant (foliar or root) with less loss and enhanced Fe ion bioavailability.

NanoCAT™ IronCoat
> IONP for Paint Iron Pigment with micaceous iron oxide use as a protective coating on steel structures and Polymer Coating with Metal and Magnetic properties.

NanoCAT™ IronMedic
> IONP for Contrast Agents in magnetic resonance imaging (MRI) and magnetic particle imaging (MPI).

+603-7967 6273 ts_nanocat@um.edu.my Nanotechnology and Catalysis Reserach Centre nanocat.um

NANOCAT POSTGRADUATE STUDENTS

6 PhD Completions

Lim Lai Peng (PhD with Distinction)
Tai Xin Hong (PhD with Distinction)
Chong Soon Weng (PhD)
Md. Shalauddin (PhD)
Nurul Athirah Binti Ismail (PhD)
Syed Tawab Shah (PhD)

5 MPhil Completions

Syabilah Binti Sazeli (MPhil)
Siti Hajjar Binti Hassan (MPhil)
Brandon Ng Ywe Soong (MPhil)
Lia Zaharani (MPhil)
Chua Wen Hong (MPhil)

LIST Of ITP STUDENTS (BASED ON INSTITUTION): YEAR 2017-2022

Name of The Institution	2017	2018	2019	2020	2021
AIMST University, Malaysia					1
UITM, Malaysia			1		3
Politeknik Nilai, Malaysia					1
University Technology Petronas, Malaysia				3	2
Universiti Malaya, Malaysia	15			1	0
University Sarawak Malaysia					2
Tunku Abdul Rahman University College, Malaysia	4	5			3
University Kebangsaan Malaysia				1	
University Terengganu, Malaysia				1	
Universiti Malaysia Perlis, Malaysia				1	
M'sila, Algérie				2	
SBA Algeria (Sidi-Bel-Abbes University)				1	
Polytech Orléans, France			1		
Navy Engineering College , National University of Sciences & Technology (NUST), Pakistan			1		
Multimedia University, Malaysia	2	5			
University of Nottingham	3				
Ucsi University	1				


October / March Intake
MASTER OF APPLIED SCIENCES (NANOTECHNOLOGY)
Open for MALAYSIAN & INTERNATIONAL Candidates
UNIVERSITI MALAYA
NANOCAT
First in Malaysia
Flexible Mode
Unique upskilling and reskilling opportunities in Nanotechnology
Emerging technologies need nanoscience and nanotechnology
The Master of Applied Sciences (Nanotechnology) program is a program that is carefully crafted and highly relevant to the current needs of the nanotechnology industry. This program is capable of producing graduates who have in-depth knowledge as well as the necessary skills in the field of nanotechnology, in line with current developments. For the sustainability of the program, the syllabus for the courses offered will be evaluated from time to time according to the needs of the industry and sectors related to the application of impactful education practices. Feedback and surveys from graduates and employers are also used as a factor to assess the appropriateness of course offerings. This program is in line with the National Nanotechnology Policy and Strategy (DSNN) 2021-2030 and the National Policy of Science, Technology and Innovation (NPSTI) 2021-2030, with the aim to create a dynamic ecosystem and to drive Malaysia towards a high-income economy by 2030.
List of Subjects :
Nanotechnology
Research Methodology
Dissertation
Core Subjects (36 credit hours)
Design, Synthesis and Fabrication
Characterization Techniques
Nanosafety and Health
Nanoelectronics
Nanomedicine
Nanobiotechnology
Environmental Nanobiotechnology
Nanobiotechnology in Food and Agri-culture
Elective Subjects (6 credit hours) (Select 2)
Total Credit Hour : 42
Programme Duration
One and a half year
Career Opportunities
Scientist, Technologist, R&D engineer, industrial expert and consultant, startup founder, chief technology officer, nanoscience and nanotechnology educator, specialist at industry and governmental agency.
For more information:
https://nanocat.um.edu.my/nanotechnology
nanocat@um.edu.my
+603-7967 6959 Or
Assoc. Prof. Dr. Ong Boon Hoong (Program Coordinator)
bhong@um.edu.my
+603-7967 7022 (ext: 2930)
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MNIJ
Malaysian NANO
An International Journal
Malaysian NANO-An International Journal (MNIJ) is an open access peer-reviewed, multi-disciplinary journal twice yearly published by the Nanotechnology & Catalysis Research Centre (NANOCAT), University of Malaya, Malaysia. MNIJ's editorial board is a gathering of experts from different countries around the world seeking to provide a valuable, scientifically rigorous source of information covering a wide variety of theoretical and experimental aspects of nanoscience as well as applications of nanoscience and nanotechnology in agricultural science, biotechnology, basic sciences, engineering, medical sciences and other similar fields.
MNIJ offers a multidisciplinary source of information in all subjects and topics related to Nanoscience and Nanotechnology. MNIJ aims to offer researchers, academics, students and interested individuals worldwide an opportunity to get informs of latest advancements in Nanoscience and Nanotechnology.
Malaysian NANO-An International Journal (MNIJ) publishes the following types of manuscripts:
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⇒ Review Articles
⇒ Short Communication
⇒ Letters
GUIDANCE FOR SUBMISSION
Submissions must be made to MNIJ Journal website (http:mnij.um.edu.my/) or via e-mail (mnij@um.edu.my) only electronically.
The submission has not been previously published, nor is it before another journal for consideration.
Malaysian NANO-An International Journal (MNIJ) is published in English only (British English and American English) consistently throughout the text.
MNIJ adheres to the Harvard referencing style (parenthetical referencing) for citation of other published works and the submission file is in Microsoft Word (.DOC or .DOCX) and PDF file format.
Further information please visit MNIJ Journal website : http://mnij.um.edu.my/
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Quality with reach
Partner with a highly visible open access journal with a vast, multidisciplinary audience, and free article process charge.
Quality with an edge
Publish with an organization known for a high level of curation and best-in-class editorial processes
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Issue 2, volume 1, 2021
Great work. With great care.
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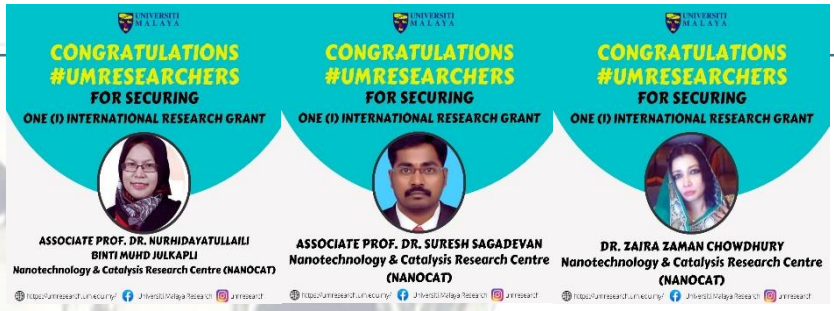
https://mcij.um.edu.my/
We support our authors throughout the publication process with a hands-on editorial team, speed to publication, free article process charge (APC), and a high level of reach and visibility so their work will be widely read and cited by their peers.

AWARDS & DISTINCTIONS

Excellent HICoE and UMCoE; Academic staff with the most highly cited paper (science)

Dr Chee Chin Fei, Dr Lee Kian Mun, Dr Yasmin Abdul Wahab and Mr. Mohamad Safuan for awarding the Anugerah Perkhidmatan Cemerlang (APC) and Sijil Perkhidmatan Cemerlang (SPC) Universiti Malaya



Associate Prof. Dr. Nurhidayatullaili Binti Muhd Julkapli, Associate Prof. Dr. Suresh Sagadevan, and Dr. Zaira Zaman Chowdhury on the incredible accomplishments of securing International Grants

NANOCAT won two medals (Gold and Bronze) in PECIPTA 2022 for inovation in two protypes

1) Smart Photoactive Air Purification Curtain Fabric (Fresh Air Curtain)

2) A Kit for Detecting Multiple target DNA Species in Food

Congratulations to Associate Prof Dr Juan Joon Ching and Professor Dr Mohd Rafie Bin Johan teams for the high achievement.

Prof. Dr. Mohd Rafie Johan, Assoc. Prof. Dr. Suresh Sagadevan, and Assoc. Prof. Dr. Lee Hwei Voon on the incredible success of published in the top 10% Web of Science (WoS) Indexed Journals.

Associate Professor Dr Nurhidayatullaili and Dr Yasmin for awarding the FRGS 2022.

Associate Professor Dr Lai Chin Wei for being awarded Best Young Member for Institute of Mechanical Engineers

AWARDS & DISTINCTIONS

Dr. Marlinda Binti Ab Rahman on the incredible accomplishments of securing the Prototype Research Grant Scheme (PRGS 2022-1)

Congratulations Ms Durga Devi Suppiah for being Promoted to Senior Research Officer Q48.

Nanocat students on successfully completing their studies in the 62nd Universiti Malaya Convocation Ceremony

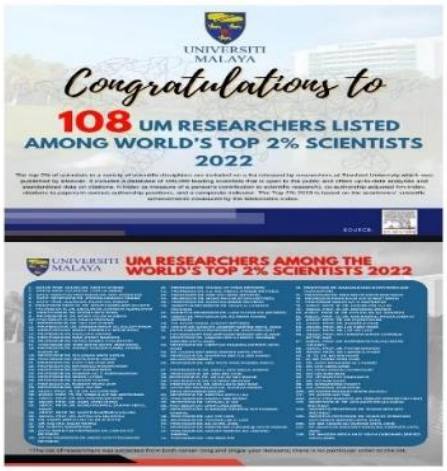
Mr. Koh Jin Kwei has won the 4th place (consolation prize with rm 100) in Pertandingan Penyelidikan Innovasi Nanoteknologi (PIN) Program Nano Kebangsaan 2022, Bangi Resort Hotel

Best Paper Awards for the 1st Postgraduate Students Research Paper Competitions

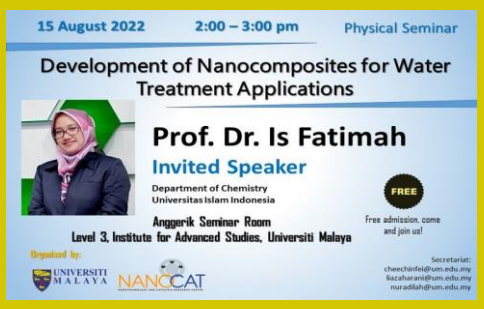
MRC-MERANTI Commercializati on matching day with NANOCAT as an exhibitor for rubber product nanotechnology

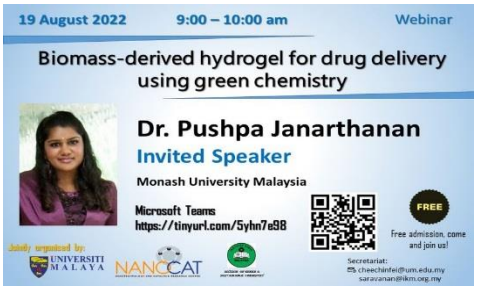
Ms. Phoon bao lee for awarding the 1st place in VIRTUAL UM3MT Competition @ Faculty level

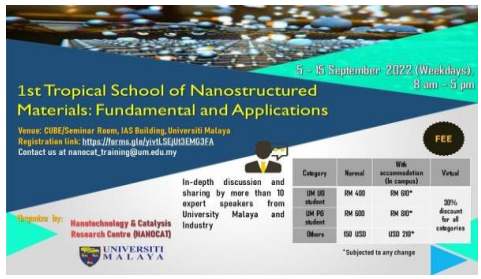
Prof. Dr. Mohd Rafie Johan, Prof. Dr. Wan Jefrey Basirun, Assoc. Prof. Ir. Ts. Dr. Lai Chin Wei, Assoc. Prof. Dr. Juan Joon Ching, Assoc. Prof. Dr. Nader Ghaffari Khaligh, and Assoc. Prof. Dr. Suresh Sagadevan, Prof. Dr. Sharifah Bee O.A Abd Hamid (Allahyarhamah), Assoc. Prof. Dr. Lee Hwei Voon, Assoc. Prof. Dr. Nurhidayatullaili Muhd Julkapli, Dr. Zaira Zaman Chowdhury, Dr. Lee Kian Mun are listed among world's top 2% scientists 2022

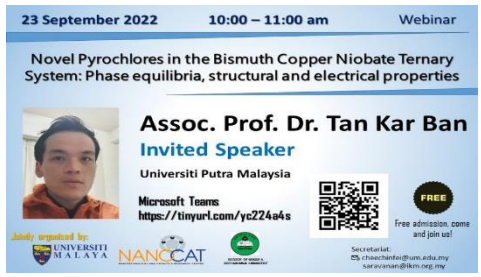


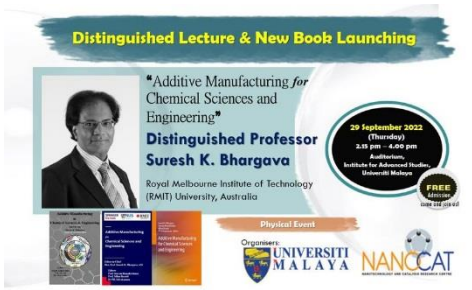
SEMINAR/WEBINAR











COLLABORATORS

Intensification in networking and research collaboration were formalized through 15 MOUs (2 national and 13 international), 10 MOAs (6 national and 4 international). The co-operation has given mileage for joint publications in WoS journals with high impact.

COLLABORATORS

MOU

International

- University of the Western Cape
- Iraqi Forum for Intellectures and Academics
- Peace University
- Wajufo Investment Holdings Co. Ltd
- University of Sydney
- ProNEXO Engineering Consultancy
- Cihan University Sulaimaniya
- GLA University
- Corporation of Research and Industrial Development
- Tikrit University
- Institute for Color Science and Technology
- Kharazmi University
- Sari Agricultural Sciences & Natural Resources University

National

- Universiti Teknologi Petronas
- Universiti Teknologi Mara
- Sime Darby plantation

MOA

International

- Thai Kiwa Chemical Co. Ltd

National

- Sunway University
- International Islamic University Malaysia
- Universiti Sains Malaysia
- Karex Industries Sdn Bhd
- Global Envdk Sdn. Bhd.
- Nanoverify Sdn Bhd

PUBLICATIONS 2022

No.	Article/Review	Quartile
1	Zaharani, L., Johan, M. R., Titinchi, S., & Khaligh, N. G. (2022). 4-(Dimethylamino)pyridinium chlorosulfonate: A new ionic liquid exhibiting chlorosulfonic acid action as monoprotic Bronsted acid and no sulfonating reagent. Journal of Molecular Liquids, 345, 7. doi: 10.1016/j.molliq.2021.118261	Q1
2	Akhter, S., Shalauddin, M., Basirun, W. J., Lee, V. S., Ahmed, S. R., Rajabzadeh, A. R., & Srinivasan, S. (2022). A highly selective bifunctional nanosensor based on nanocellulose and 3D polypyrrole decorated with silver-gold bimetallic alloy to simultaneously detect methotrexate and ciprofloxacin. Sensors and Actuators B-Chemical, 373, 13. doi:10.1016/j.snb.2022.132743	Q1
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5	Johari, S., Johan, M. R., & Khaligh, N. G. (2022). An overview of metal-free sustainable nitrogen-based catalytic knoevenagel condensation reaction. Organic & Biomolecular Chemistry, 20(11), 2164-2186. doi: 10.1039/d2ob00135g	Q1
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11	Mousavi, S. M., Hashemi, S. A., Kalashgrani, M. Y., Rahmanian, V., Gholami, A., Chiang, W. H., & Lai, C. W. (2022). Biomedical Applications of an Ultra-Sensitive Surface Plasmon Resonance Biosensor Based on Smart MXene Quantum Dots (SMQDs). Biosensors-Basel, 12(9), 24. doi: 10.3390/bios12090743	Q1
12	Padmanabhan, V. P., Sivashanmugam, P., Kulandaivelu, R., Sagadevan, S., Sridevi, B., Govindasamy, R., & Thiruvengadam, M. (2022). Biosynthesised Silver Nanoparticles Loading onto Biphasic Calcium Phosphate for Antibacterial and Bone Tissue Engineering Applications. Antibiotics-Basel, 11(12), 17. doi: 10.3390/antibiotics11121780	Q1
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No.	Article/Review	Quartile
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36	Tai, X. H., Lai, C. W., Yang, T. C. K., Johan, M. R., Lee, K. M., Chen, C. Y., & Juan, J. C. (2022). Highly effective removal of volatile organic pollutants with p-n heterojunction photoreduced graphene oxide-TiO2 photocatalyst. Journal of Environmental Chemical Engineering, 10(2), 14. doi: 10.1016/j.jece.2022.107304	Q1
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45	Hashem, A., Hossain, M. A. M., Marlinda, A. R., Al Mamun, M., Sagadevan, S., Shahnavaz, Z., . . . Johan, M. R. (2022). Nucleic acid-based electrochemical biosensors for rapid clinical diagnosis: Advances, challenges, and opportunities. Critical Reviews in Clinical Laboratory Sciences, 59(3), 156-177. doi: 10.1080/10408363.2021.1997898	Q1
46	Sibhatu, A. K., Weldegebrieal, G. K., Sagadevan, S., Tran, N. N., & Hessel, V. (2022). Photocatalytic activity of CuO nanoparticles for organic and inorganic pollutants removal in wastewater remediation. Chemosphere, 300, 18. doi: 10.1016/j.chemosphere.2022.134623	Q1
47	Mousavi, S. M., Hashemi, S. A., Gholami, A., Kalashgrani, M. Y., Rao, N. V., Omidifar, N., . . . Chiang, W. H. (2022). Plasma-Enabled Smart Nanoexosome Platform as Emerging Immunopathogenesis for Clinical Viral Infection. Pharmaceutics, 14(5), 21. doi: 10.3390/pharmaceutics14051054	Q1
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No.	Article/Review	Quartile
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51	Chan, S. S., Low, S. S., Chew, K. W., Ling, T. C., Rinklebe, J., Juan, J. C., . . . Show, P. L. (2022). Prospects and environmental sustainability of phyconanotechnology: A review on algae-mediated metal nanoparticles synthesis and mechanism . Environmental Research, 212, 14. doi: 10.1016/j.envres.2022.113140	Q1
52	Chen, W. H., Chen, Z. Y., Hsu, S. Y., Park, Y. K., & Juan, J. C. (2022). Reactor design of methanol steam reforming by evolutionary computation and hydrogen production maximization by machine learning. International Journal of Energy Research, 46(14), 20685-20703. doi: 10.1002/er.7543	Q1
53	Appaturi, J. N., Andas, J., Ma, Y. K., Phoon, B. L., Batagarawa, S. M., Khoerunnisa, F., . . . Ng, E. P. (2022). Recent advances in heterogeneous catalysts for the synthesis of alkyl levulinate biofuel additives from renewable levulinic acid: A comprehensive review. Fuel, 323, 25. doi: 10.1016/j.fuel.2022.124362	Q1
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58	Why, E. S. K., Ong, H. C., Lee, H. V., Chen, W. H., Asikin-Mijan, N., Varman, M., & Loh, W. J. (2022). Single-step catalytic deoxygenation of palm feedstocks for the production of sustainable bio-jet fuel. Energy, 239, 13. doi: 10.1016/j.energy.2021.122017	Q1
59	Asikin-Mijan, N., AbdulKareem-Alsultan, G., Mastuli, M. S., Salmiaton, A., Mohamed, M. A., Lee, H., & Taufiq-Yap, Y. H. (2022). Single-step catalytic deoxygenation-cracking of tung oil to bio-jet fuel over CoW/silica-alumina catalysts. Fuel, 325, 13. doi: 10.1016/j.fuel.2022.124917	Q1
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61	Mohammed, M., Rahman, R., Mohammed, A. M., Adam, T., Betar, B. O., Osman, A. F., & Dahham, O. S. (2022). Surface treatment to improve water repellence and compatibility of natural fiber with polymer matrix: Recent advancement. Polymer Testing, 115, 24. doi: 10.1016/j.polymertesting.2022.107707	Q1
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63	Qutub, N., Singh, P., Sabir, S., Umar, K., Sagadevan, S., & Oh, W. C. (2022). Synthesis of Polyaniline Supported CdS/CdS-ZnS/CdS-TiO2 Nanocomposite for Efficient Photocatalytic Applications. Nanomaterials, 12(8), 21. doi: 10.3390/nano12081355	Q1
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68	Munusamy, S., Sivasankaran, R. P., Sivaranjan, K., Sabhapathy, P., Narayanan, V., Mohammad, F., & Sagadevan, S. (2022). Vanadium-PEDOT-PANI hybrid nanocomposite modified glassy carbon electrode for enhanced electrochemical and photocatalytic activities. Electrochimica Acta, 428, 13. doi: 10.1016/j.electacta.2022.140924	Q1
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